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ABSTRACT

A study was conducted to investigate the long term transfer effect of metaphoric allusion used to clarify unfamiliar subject matter. Forty-nine high school students were given unfamiliar prose materials variously augmented by metaphoric allusion. The subjects' immediate performance on a transfer task was compared to their performance on an identical task one week later. Significant differences associated with type of metaphoric allusion persisted over a period of one week, suggesting durable integrative effects stemming from use of metaphor to introduce novel information. (Author/RL)

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Long Term Transfer Effect of Metaphoric Allusion

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Long Term Transfer Effect of Metaphoric Allusion

When learners are introduced to new conceptual information they are expected not only to comprehend that information in all its complexity but to comprehend it so that it is readily applicable in relevant new situations. When that new information is abstract, learners may resort to a number of strategies for understanding it. One strategy is to seek objective correlates by which comparisons with familiar experience can be made. Such comparisons provide common sense tests of the new information's relational integrity and thereby facilitate learners' understanding of it.

Because of the clarifying power of direct comparisons with familiar experience, teachers and writers often reinforce their presentation of new information by alluding to a domain of knowledge commonly held by learners. If the information is complex enough to require extensive allusion to familiar experience, the teacher or writer may be obliged to contrive a tropic fiction to which metaphoric allusion can be made. Tropic fictions are believed to be useful for structuring thinking about unfamiliar content so that its internal relations are similar and in analogous proportion to thinking about the content of the fiction (Vaihinger 1925; Kant 1781). As in the case of metaphor comprehension in general, metaphoric allusion to a tropic fiction is believed to prompt learners' thinking processes to turn round upon themselves in search of similarities in attributes and conceptual relations (Black 1962; Schon 1980; Sticht 1980). By having learners identify the relative position of attributes of familiar concepts, allusions to tropic fictions

enables learners to fix the relative position of attributes of unfimiliar concepts and provisionally assign them the values of attributes of familiar concepts (Ortony 1975, 1980; Petrie 1980). Essentially, then, the function of metaphoric allusion is to induce analogical thinking.

The concern of the present study was to investigate the transfer value tropic comparisons hold for learning additional content from other topically related texts. Recently Hayes (1980) and Hayes and Tierney (1980) have reported research which shows that the provision of such comparisons results in a broader, more integrated processing of text. However, it appears that the comparison must be made in the text itself. If it is made in advance of reading the text or both before and during reading the text, the result is not as broad and integrative.

Since it was somewhat surprising to find that the broader, more integrative processing resulted from having a tropic comparison stated in the text, rather than both advance and in-text comparisons, the present study was undertaken to replicate the previous result and extend it to a different content area. Another new question addressed by this study was whether the effect of tropic allusion persists over time. Since school reading assignments are typically distributed over time with the expectation that connections between them will be made, a concern of practical significance was to investigate how a sequence of text learning experiences involving tropic allusion would affect the processing of additional text material given at a later date. Thus, the study was guided by the following research question:

Over an interval of seven days, to what extent would metaphoric allusion, provided by a comparative organizer and/or embedded in text, facilitate the integration of novel information with learners' existing knowledge? In order to explore the nature of the cognitive operations affected by metaphoric allusion, the specific aspects of the following subsidiary question were addressed:

> Over a seven-day interval, to what extent would subjects' written recalls of a transfer passage change with respect to - (a) the number and proportion of information units that explicitly repeat those of the transfer passage, (b) the number and proportion of information units that generalize those of the transfer passage or are thematically related to the transfer passage, and (c) the number and proportion of information units neither accurately nor plausibly reflecting the content of the transfer passage?

Method

Subjects

Subjects were eleventh and twelfth grade students who had been identified by their English teachers as average or better readers. These students were assigned at random to one of five treatment groups comprising 11 subjects each. Due to absenteeism, the actual number of subjects in the groups ranged from 9 to 11. Altogether there were 49 subjects to provide data for the study.

Materials

Prose passages were exerpted from textual materials currently in use in a nearby high school and adapted for purposes of examining the questions of the present investigation. The experimental materials included: (a) and (b) two 600-word instructional passages on the measurement of electric energy, identical except that one passage explicitly alluded to features of household plumbing analogous to

Electric circuits while the other passage did not; (c) a 300-word comparative organizer on household plumbing; (d) a 300-word control passage on careers in electricity; (e) a 600-word control passage on the electric power industry; and (f) a 150-word transfer passage on kilowatt hours as a measure of electric power consumption. These materials are shown in Appendix items A through F.

Procedure

Data were collected on two occasions. One the first occasion each of the five treatment groups read one of five sequences of passages which were as follows: Group 1 first read the comparative organizer, ie., the plumbing passage, then the electricity passage with allusions to plumbing second, and finally the transfer passage on kilowatt hours. Group 2 read the careers passage first, the electricity passage with allusions to plumbing second, and finally the transfer passage on kilowatt hours. Group 3 read the comparative organizer on plumbing first, the electricity passage without metaphoric allusions second, and finally the transfer passage on kilowatt hours. Group 4 read the careers passage first, the electricity passage without metaphoric allusions second, and finally the transfer passage on kilowatt hours. Group 5 read the careers passage first, the passage on history of the electric power industry second, and finally the passage on kilowatt hours. Following reading, all groups recalled in writing the transfer passage on kilowatt hours.

One week later, the students were given the same transfer passage on kilowatt hours to read and recall in writing. No strict time limits were imposed. These experimental procedures are depicted in Figure 1.

Insert Figure 1 Here

Scoring

In order to provide a model against which to compare subjects' recall protocols, a template text base was prepared for each transfer passage according to procedures detailed by Turner and Greene (1977). This template text base is shown in Appendix item G. The protocol was scored by comparing it to its template text base by a procedure adapted from Drum (1979). Drum's method of scoring provided for examining the degree of similarity of recalls to the transfer passages. The propositions of each protocol were compared to those of the template text base and identified as either repeating propositions of the template text base or representing reasonable inferences drawn from the transfer passage. Propositions not consistent with the text were also counted in order to detect any association between treatment and amount of misinformation generated.

Reliability of the scoring procedure was established by randomly selecting a number of recall protocols and having them scored by another individual familiar with the text analysis system used in this study. The interscorer proportion of agreement obtained was .96.

Analysis

Recall Data were subjected to a 2 X 5 (times X treatments) repeated measures analysis of variance. In order to isolate the immediate from the long term effects of the treatments, the data were also subjected to separate one-way analyses of variance. Significant differences detected through analysis of variance were located by Dunn's test.

Results

The findings of the study are summarized in Table 1. The relative

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Insert Table 1 Here

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amount of each type of information found in subjects' immediate and repeated recalls are depicted in Figures 2 and 3 respectively.

Insert Figures 2 & 3 Here

In number of text reproductions generated by subjects, no significant interaction was observed between treatment and time of recall. Nor was any significant difference in text reproductions observed across treatment groups on either the immediate or repeated recall task. A significant increase was noted in the amount of text reproduced information generated across all treatment groups on the repeated recall task F (1,4) = 13.05, $p < .001$.

With respect to number of inferences, a significant ordinal interaction was found across treatment groups across time of recall tasks F (1,4) = 4.17, $p < .01$. Group 2 generated significantly more inferences on the immediate recall task that it did on the repeated recall task. On the immediate recall task Group 2 produced significantly more inferences than all other groups F (1,4) = 7.79, $p < .0001$. On the repeated recall task Group 2 significantly differed from other groups given instructional passages without metaphoric allusion F (1,4) = 2.72, $p < .05$. A significant difference in proportion of inferences relative to text reproductions was

found to exist across treatment groups F (1,4) = 7.68, $p < .01$. On the repeated recall task Group 2 significantly differed from other groups given instructional passages without metaphoric allusion F (1,4) = 2.72, $p < .05$. A significant difference in proportion of inferences relative to text reproductions was found to exist across treatment groups F (1,4) = 7.68, $p < .01$. Subjects given texts with explicit metaphoric allusions only (Group 2) produced proportionally more inferential information than the group given implicit metaphoric allusion only in the comparative organizer (Group 3) and the group given no metaphoric allusion at all (Groups 4).

For both recall tasks, significant differences were noted in the amount of incorrect information given in the subjects' recalls F (1,4) = 3.44, $p < .05$. Subjects given texts with explicit metaphoric allusions (Groups 1 and 2) produced significantly fewer units of incorrect information.

Discussion

The results obtained in the present experiement are consonant with the results of previous related research (Hayes 1980; Hayes and Tierney 1980). Consistently they show that variation in cognitive functioning may be predicted in accordance with the method by which metaphoric allusions are presented. The findings of the present study offer confirmation of a unique effect stemming from reading text augmented with explicit allusions to tropic fictions. Specifically, such allusions are associated with a greater proportion of inferential information given on immediate transfer tasks involving recall of topically related texts. Further, the findings of the present study offer evidence that although

its specific transfer effect diminishes with the passage of time, it nonetheless appears to persist over an interval of several days.

According to Kintsch and Van Dijk (1978), the proportion of generalized recall to verbatim recall serves as an indicator of level of readers' engagement with text. The greater the amount of generalized, elaborative information generated in free recall tasks, the greater the readers' engagement with text is presumed to be. Interpreted in light of Kintsch and Van Dijk's model of text comprehension, then, the recall data of the present study indicate that explicit metaphoric allusion elicits more profound engagement of text. Such allusion embedded in the text provides the material with which to build a framework for understanding but leaves the learner to construct the framework for himself. In constructing that framework, the learner more actively draws upon existing relevant knowledge.

The results can also be interpreted in light of Mayer's (1980) assimilation theory of meaningful learning which states that in order for meaningful learning to occur, the following conditions must exist: (1) reception of the new information, (2) an available, familiar context with which the learner can assimilate the new information, and (3) active use of this context. In terms of this theory, the group that received the tropic allusion explicitly in the text was apparently the only group for which all three of these conditions were met. All groups received the new information. However, the groups that read irrelevant passages (Group 5) on passages with no tropic allusion (Group 4) did not have an available assimilative context. The group that read the plumbing passage

before the electrical circuit passage had an available assimilative context but did not actively use it.

Whether one uses Kintsch and Van Dijk's idea of engagement or Mayer's idea of activity to explain the present result, there is a troublesome finding for either. Specifically, one would expect that the group that read the plumbing passage before the electric circuit passage and also read the form of the electric circuit passage in which electricity is explicitly compared to plumbing (Group 1) would have actively used the comparison and therefore have shown a more generalized learning outcome.

Since this same result has also been found for an entirely different set of materials (cricket analogous to baseball) it seems to be quite reliable and therefore important to explain. One reason why subject in this group do not seem to be as active in using the tropic allusion as are the subjects who read about plumbing only within the text on electric circuits may be simply that they did not need to be. Perhaps when an intact structure is made available through an adjunct device such as a comparative organizer less interaction with existing knowledge is required to make sense of the text.

From a practical standpoint it is interesting that metaphorical allusion, however presented, apparently did not confuse, mislead, or otherwise inhibit subjects' learning from the texts. In fact, the data showed that there were significantly fewer incorrect statements produced on recall tasks by subjects given explicit metaphoric allusion than by other subjects.

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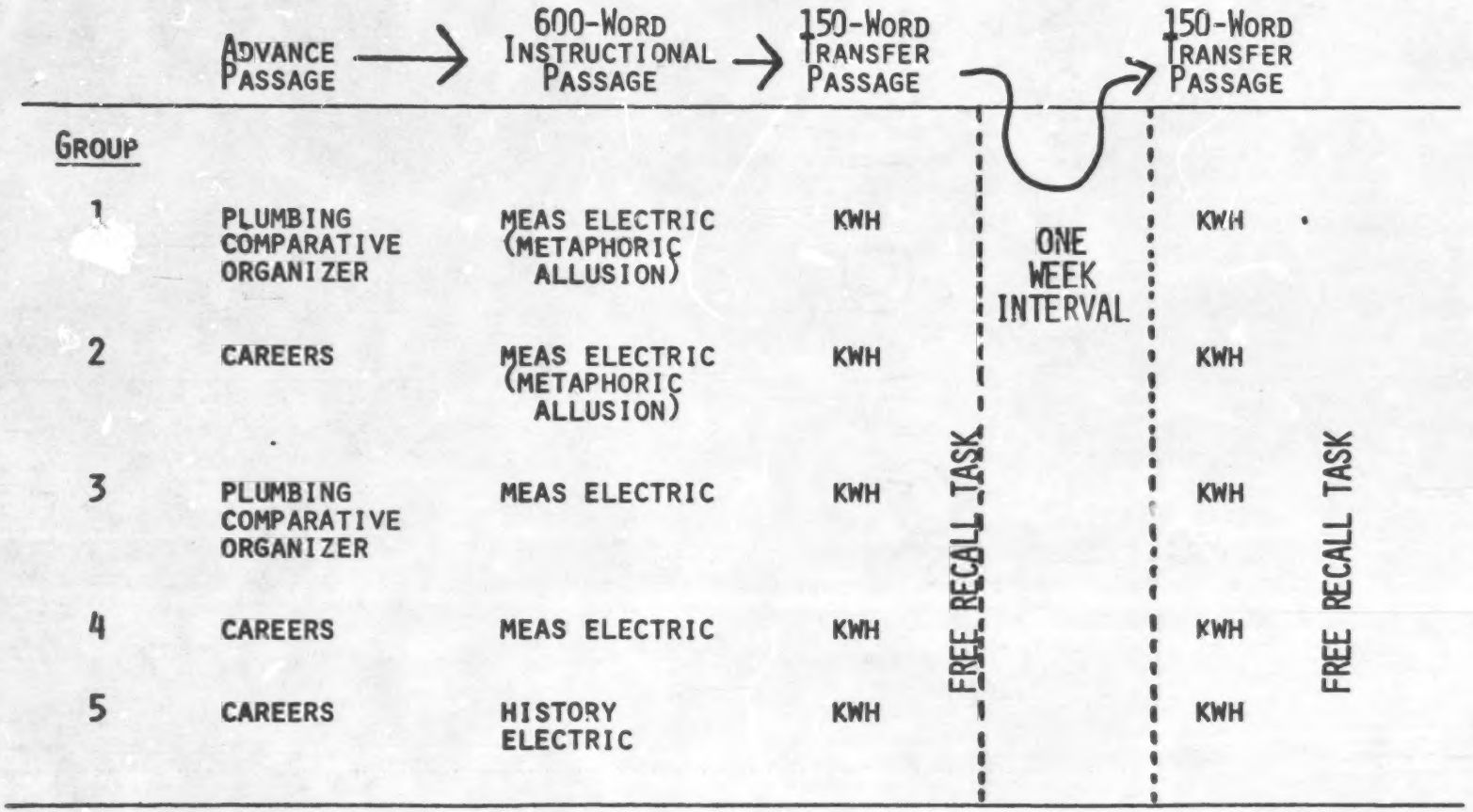
Table 1

SUMMARY OF MEANS/STANDARD DEVIATIONS OF PROPOSITIONS RECALLED

Group	N	Type of Information: Txt Rpro	Inference	Incorrect
Immediate Recall Task				
1 ($P + E_{MA}$)	9	11.11/3.88	6.44/5.41	.33/.70
2 ($X + E_{MA}$)	11	10.18/5.13	10.09/5.14	.18/.40
3 (P + E)	11	11.63/5.66	3.09/1.57	1.45/2.42
4 (X + E)	9	11.55/5.72	2.22/1.78	1.87/2.35
5 (X + X)	9	11.33/3.08	3.88/2.36	1.33/1.58
All	49	11.14	5.26	1.00
Repeated Recall Task				
1 ($P + E_{MA}$)	9	12.88/5.01	4.88/3.78	.22/.44
2 ($X + E_{MA}$)	11	12.27/5.36	5.54/3.32	.09/.30
3 (P + E)	11	17.72/9.88	2.54/1.96	.36/.50
4 (P + E)	9	16.11/5.34	2.33/2.34	1.00/1.41
5 (X + X)	9	13.77/4.84	5.11/2.84	1.33/1.32
All	49	14.59	4.08	.56

FIGURE 1

TREATMENT SEQUENCE



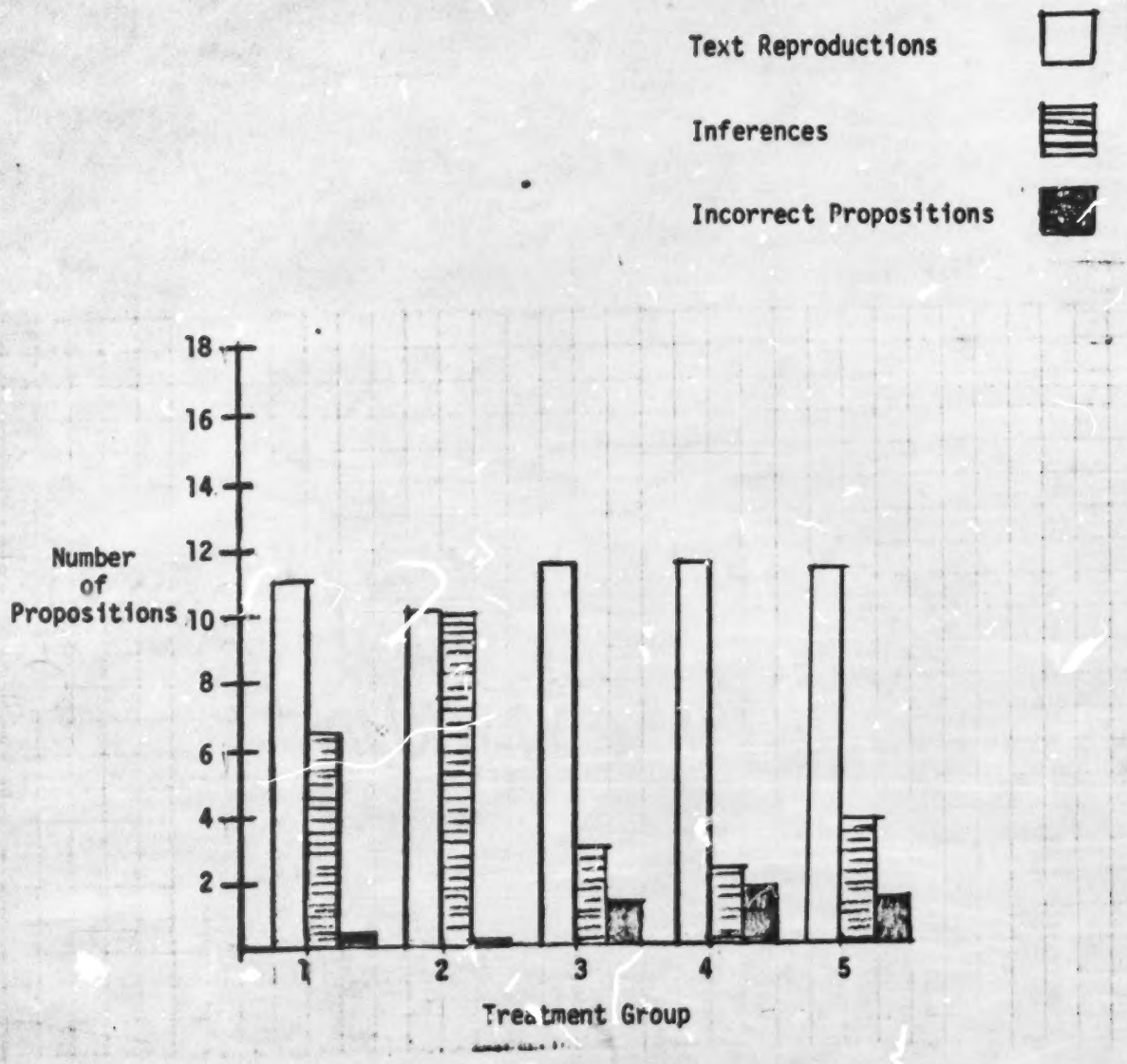


Figure 2. Units of information recalled--immediate recall task.

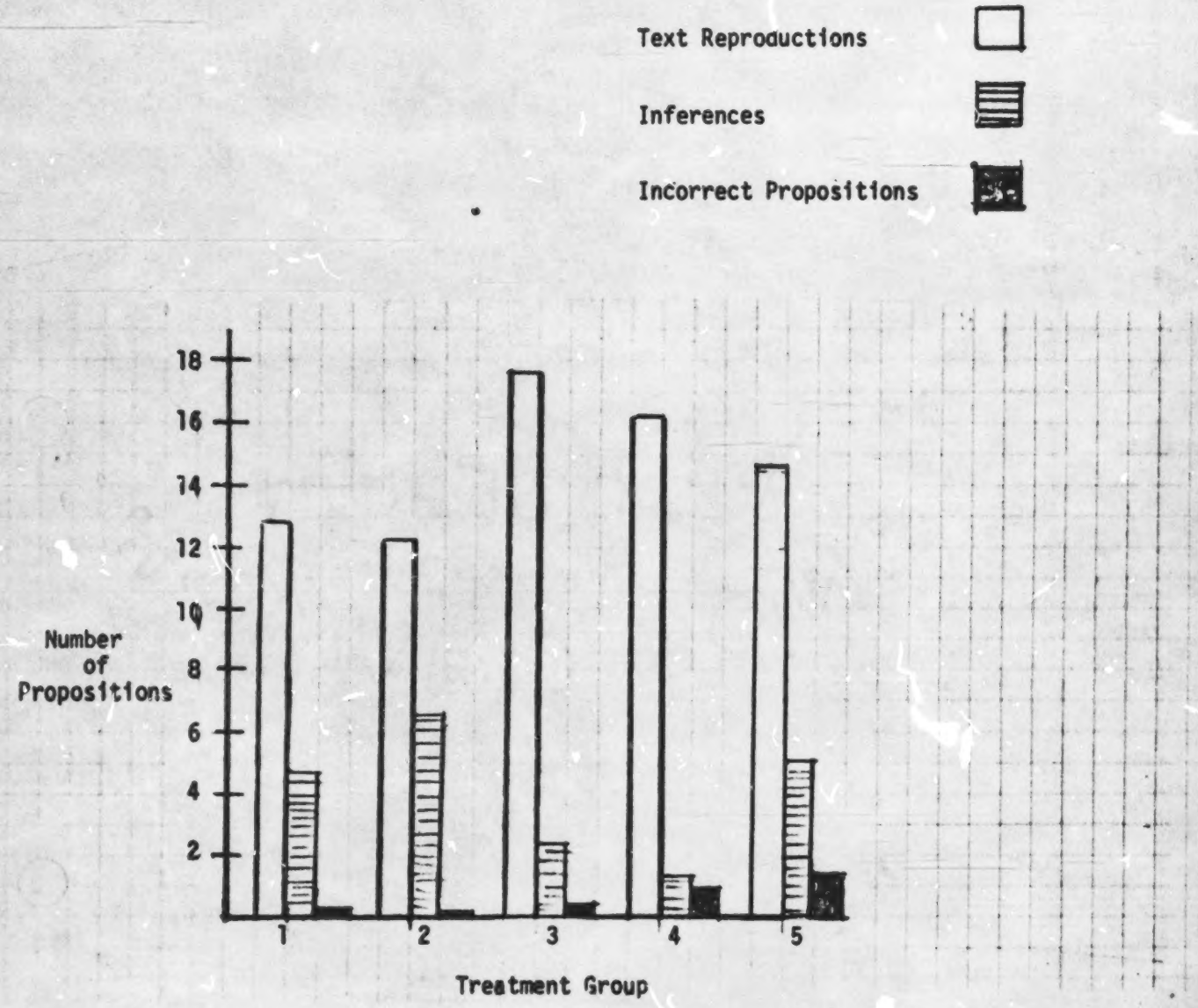


Figure 3. Units of information recalled--repeated transfer task.

A

INSTRUCTIONAL PASSAGE WITH METAPHORIC ALLUSION

Measurement of Current Electricity

An electric current is the pathway through which electric current moves. An electric current can be compared to the flow of water in a pipe. The water in a water system is forced through the pipes by a pump.

When you measure a quantity of water flowing through a pipe, you use a unit such as the gallon (gal). When you measure a quantity of electricity, you need a unit of measurement. The unit of electric charge is the coulomb. One coulomb is equal to about 6.3 million billion, electrons. To count this many electrons, one by one, at a rate of 1 electron/sec, would take about 200 billion years.

Rate of flow of water through a pipe is measured as a quantity per unit of time. Water flows from a pipe at a rate of so many gallons per minute. The rate of flow of electricity through a conductor is measured in a unit called an ampere. One ampere is equal to the flow of one coulomb of electric charge per second. The abbreviation for ampere is amp.

In some ways a cell or battery is similar to a water pump. The cell causes electrons to flow through a circuit. The water pump causes water to flow through pipes.

Large water pumps create more pressure than do smaller pumps. This occurs because a large pump can produce a greater force per area. The force produced by the pump makes the water travel through a pipe.

Force is responsible for the movement of electrons in a wire. Electricity flows from one point to another because of an electric force. The energy given to the charges is measured in <u>volts</u>. For instance, an automobile battery may produce 6 volts of electric energy per charge. Other automobile batteries produce 12 volts. The 12-volt storage battery that produces 12 volts is similar to a water pump that can create high water pressure. Because it has a higher voltage, the 12 volt battery can supply more energy than a 6 volt battery.

In your home wiring system, there are 110 volts of electricity. However, an electric stove or electric clothes dryer may need 220 volts. These appliances use more energy. Therefore, they require a higher voltage. A 220 volt circuit is easily added to a home wiring system. However, it should only be done by an experienced electrician.

The ease with which electricity flows through a conductor depends on the material in the conductor. Every substance offers some electric resistance to the flow of electricity. This electric resistance is measured in units called ohms. Electric resistance describes the difference between wires which allow different amounts of current to flow through them, even though the voltages are the same. A wire of high electric resistance is one that resists the flow of current. A wire of low electric resistance is one that has little resistance to the flow of current.

The electric resistance of a wire is also determined by its length and thickness. A long copper wire has more resistance than a short copper wire. A thick copper wire has less resistance than a thin copper wire.

Here again, comparison to a water pumping system is helpful. The size of the pipe affects the quantity of water that can flow through it. In 1 min, more water can flow through a 4 cm pipe than through a 2 cm pipe. In effect, the thicker pipe has less resistance to water flow. Resistance to electron flow decreases as the thickness of the wire increases.

B

INSTRUCTIONAL PASSAGE WITHOUT METAPHORIC ALLUSION

Measurement of Current Electricity

An electric current is the pathway through which electric current moves. Electric current is produced by the movement of electrons through a wire. It is by this movement of electrons through a wire that electrical energy is transmitted from its source to the place it is needed.

The size of an electric current is determined by the number of electrons that flow through a wire per unit of time. When you measure a quantity of electricity, you need a unit of measurement. The unit of electric charge is the coulomb. To count this many electrons, one by one, at a rate of one electron per second would take about 200 billion years.

Rate of movement of electrons through a wire is measured as a quantity per unit of time. Electrons move through a wire at a rate of so many coulombs per second. The rate of movement of electricity through a conductor is measured in a unit called an ampere. One ampere is equal to the flow of one coulomb of electric charge per second. The abbreviation for ampere is amp.

In some ways, a cell or battery is similar to a generator. The cell causes electrons to move through a circuit. The generator also causes electrons to move through a circuit.

Large electric generators create more energy than do smaller generators. This occurs because a large generator can produce a greater force per area. The force produced by the generator makes the electrons travel through a wire.

Force is responsible for the movement of electrons in a wire. Electricity flows from one point to another because of an electric force. The energy given to the charges is measured in volts. For instance, an automobile battery may produce 6 volts of electric energy per charge. Other automobile batteries produce 12 volts. The 12-volt storage battery that produces 12 volts is similar to a generator that can create electricity. Because it has a higher voltage, the 12-volt battery can supply more energy than a 6-volt battery.

In your home wiring system, there are 110 volts of electricity. However, an electric stove or electric clothes dryer may need 220 volts. These appliances use more energy. Therefore, they require a higher voltage. A 220 volt circuit is easily added to a home wiring system. However, it should only be done by an experienced electrician.

The ease with which electricity moves through a conductor depends on the material in the conductor. Every substance offers some electric resistance to the flow of electricity. This electric resistance is measured in units called ohms. Electric resistance describes the difference between wires which allow different amounts of current to move through them, even though the voltages are the same. A wire of high electric resistance is one that resists the flow of current. A wire of low electric resistance is one that has little resistance to the flow of current.

The electric resistance of a wire is also determined by its length and thickness. A long copper wire has more resistance than a short copper wire. A thick copper wire has less resistance than a thin copper wire.

It is important to take into account the size of a conductor. The size of the wire affects the quantity of electrons that can flow through it. In 1 sec, more electrons can flow through a 2.5 mm wire than through a 1.5 mm wire. In effect, the thicker wire has less resistance to electron flow. Resistance to electron flow decreases as thickness of the wire increases.

C

COMPARATIVE ORGANIZER

Household Plumbing

The plumbing supply system carries water from a well, a storage tank or from underground water mains into your house and around to all the fixtures (sinks, showers, toilets) and to such appliances as the washing machine and dishwasher. If you live in town, your water is delivered to you through underground water mains.

The quantity of water delivered depends on the size of the pipes and the pressure created by the pumps of the delivery system. Larger pipes can accommodate a higher rate of flow, and larger pumps can produce greater amounts of force to push the water flow. The amount of water delivered is measured as the rate of water flow per unit of time, usually in terms of gallons per minute.

Water is delivered to your supply system under pressure. Normal pressure is about 50 pounds per square inch (abbreviated "psi"), though it can vary greatly--either higher or lower. From the main, the water supply travels underground directly to your house, probably in 1-inch or 3/4 inch pipe. In cold-winter areas, the water meter is just inside the wall in the basement. At this point you may also find a shutoff valve (not every house has one) that you can use to turn off the water supply to the entire house. In cold-winter climates this valve will be just inside the wall; in moderate climates it may be outside at the wall. It's a good idea for every household member to know its location.

Once inside the house, the pipe branches out into pipes of smaller diameters to deliver water to all outlets. Water pressure is greater in these pipes of smaller diameter, since water pressure is determined by the force behind the flow per area of pipe. Pressure increases as the force remains constant and the pipe area diminishes.

Horizontal pipe runs are generally secured to floor joists, either recesses in notches above the joists or fastened with metal straps below the joists. Long vertical runs can be supported at their bases by platforms and anchored to wall studs. Supply pipes may be installed with a slight pitch in the runs, sloping back toward the lowest point there's a valve that can be opened to drain the system.

D

CONTROL PASSAGE

Careers in Electricity

Those people employed in the marketing and sales promotion area of an electric company have a double role to play. They are important to the company's growth, and their work also benefits the way the company's customers live and work.

In four basic areas--residential, industrial, commercial, and farming--the job of the electric company marketing people is to help explore new and better ways of doing things with electric energy, and to encourage customers to make use of these new ways. As a rule, electric companies employ a staff of specialists in each of these four marketing areas.

Home service people make frequent individual and group demonstrations of new appliances and methods of using them. Their work also involves testing appliances, recipes, and techniques for food preparation; also preparing booklets, leaflets, and articles for publication in newspapers and magazines.

Electric company industrial sales representatives help industries develop more efficient methods of operation through the use of electric energy. They also encourage new industries in their service area to make full use of electricity. Their work involves meeting regularly with key people among their industrial customers, and also cooperating with other "selling allies" such as manufacturers of electrical equipment, jobbers, dealers, contractors, architects, and consulting engineers.

While specific requirements vary from company to company, industrial and commercial sales representatives are usually technically trained--often with engineering backgrounds--coupled with training or experience in selling.

Through its farm advisor, the electric company encourages and participates in any state or local program that can bring helpful information to the farm community about the use of electricity on the modern farm. More than 75 percent of the farm advisor's time, on the average, is spent in direct contact with farm customers or industrial agricultural customers. Major agricultural production equipment often costs hundreds, even thousands of dollars. So it is an important responsibility to determine if the new application will benefit the farm customer.

E

CONTROL PASSAGE

Early History of the Electric Utility Industry

The modern electric utility industry was born on September 4, 1882, at three o'clock in the afternoon. The birthplace was a modest red brick building on Pearl Street, near New York's business center. Thomas Edison signaled to an electrician, and the electrician threw a switch. Immediately, incandescent lamps began to glow in homes and offices in the surrounding neighborhood. People remarked that Edison's lamps gave a soft, even glow which was far more satisfactory than the hard, flickering light of gas jets.

The day's triumph was the result of several years hard work for Edison and his assistants. He first became interested in the possibilities of electric lighting in 1878 - when he was about 30 years old. In the following year, he demonstrated the first practical incandescent lamp. Then he turned his attention to developing the machinery and equipment necessary to make electric service available to people - including generators, power distribution systems, devices to regulate and measure the flow of electric current, sockets, fuses, and many other things.

All of this took money - lots of it. Edison's experiments and the Edison Electric Illuminating Company (which was the official name of the Pearl Street station) were financed by investors, people who had faith in what Edison was trying to accomplish. Today, about 80 per cent of the nation's electric customers are served by investor-owned electric companies.

No special training was needed by workers in the early days of the electric power business. As one of Edison's assistants recalled many years later: "It should be remembered that at the time . . . there were no manufacturing establishments either side of the Atlantic to produce the electrical machinery required. Scarcely any of the apparatus needed . . . was even invented, to say nothing of being designed."

In the early days of the industry, a worker needed only to be handy with his hands, have a goodly amount of "horse sense," together with a large measure of faith. Today, a century later with the future of the industry assured, the requirements for workers in electric power involve a wide range of skills and training. But horse sense and faith are still useful assets, and it can still be said that much important equipment remains to be invented.

Two big difficulties confronted the early electric companies. First, people had little use for electric service except for lighting - mainly streets and commercial establishments. This meant that most early electric companies operated only during the hours of darkness. Of course, this was an inefficient way of operating, and electric service was relatively costly in those days.

This obstacle was gradually overcome as people began making use of various other electricity using appliances and devices, especially the electric motor. The electric motor made it possible, for the first time in history, for a tool to be relatively far removed from its source of power. Electricity provided a clean, quiet form of power that could be sent directly by wire to the spot where it was needed.

F

TRANSFER PASSAGE

Electric appliances are rated in watts of power. Their rating in watts of power determines the quantity of power they supply. A watt is a metric unit of electric power. One watt is the power produced by 1 amp in a 1 volt circuit. The watts of power used by an electric appliance are equal to the amperes times the volts.

You cannot actually use electricity. When you use an electric current, you really use the electric energy that it creates. The amount of electric energy created depends on the watts of power and the time that the power is used: Therefore, to measure electric energy you must measure both the power and the time that it is in use.

Power companies measure electric energy in kilowatt-hours. One thousand watts are equal to one kilowatt. Remember, the prefix kilo - means 1000 times. A kilowatt-hour is the unit of energy used by 1 kilowatt in 1 hour. The symbol for kilowatt-hours is KWH. Electric bills are based on kilowatt-hours of electric energy supplied by the power company.

TEMPLATE TEXT BASE OF TRANSFER PASSAGE

1. (RATE, $, 2, 3)
2. (QUALIFY, APPLIANCES, ELECTRIC)
3. (QUALIFY, POWER, WATTS)
4. (REFERENCE, THEIR, 3)
5. (DETERMINE, $, 3, 6)
6. (SUPPLY, $, POWER)
7. (QUALIFY, 6, QUANTITY)
8. (ISA, WATT, 9)
9. (QUALIFY, UNIT, METRIC)
10. (QUALIFY, POWER, ELECTRIC)
11. (CONTRAST, EQUALS, 12, 13)
12. (QUANTITY OF, WATT, ONE)
13. (PRODUCE, $, POWER, 14)
14. (QUANTITY, AMP, ONE)
15. (LOC, IN, 14, 16)
16. (QUALIFY, CIRCUIT, 17)
17. (QUANTITY OF, VOLT, ONE)
18. (CONTRAST, EQUALS, 19, 20)
19. (USE, $, 2, 3)
20. (MULTIPLY, AMPS, VOLTS)
21. (USE, YOU, ELECTRICITY)
22. (NEGATE, 21)
23. (CONDITION, WHEN, 24, 26)
24. (USE, YOU, 25)
25. (QUALIFY, CURRENT, ELECTRIC)
26. (USE, YOU, 27)
27. (QUALIFY, ENERGY, ELECTRIC)
28. (CREATE, $, 29, 27)
29. (REFERENCE, IT, 25)
30. (DEPEND, 27, 31)
31. (CONJUNCTION, AND, 3, 32)
32. (QUALIFY, TIME, 24)
33. (CAUSALITY: THEREFORE, 24, 34)
34. (CONDITION, MUST, 35, 36)
35. (MEASURE, $, 3)
36. (MEASURE, YOU, 37)
37. (CONJUNCTION, AND, 3, 32)
38. (MEASURE, 39, 27, KILOWATT-HOURS)
39. (QUALIFY, COMPANIES, POWER)
40. (CONTRAST, EQUAL, 41, 42)
41. (QUANTITY, WATTS, ONE THOUSAND)
42. (QUANTITY, KILOWATT, ONE)
43. (REMEMBER, YOU)
44. (ISA, KILO, PREFIX)
45. (MEAN, 44, 46)
46. (QUANTITY, TIMES, 1000)
47. (ISA, KWH, 48)
48. (QUALIFY, UNIT, ENERGY, 49)
49. (USE, $, 42, 50)
50. (QUANTITY, HOUR, ONE)
51. (REPRESENT, $, 52, KILOWATT-HOUR)
52. (ISA, KWH, SYMBOL)
53. (BASE, $, 54, 55)
54. (QUALIFY, BILLS, ELECTRIC)
55. (QUALIFY, KWH, 56)
56. (SUPPLY, $, 39, 27)